

Please delete Claim 14.

REMARKS

Claims 1-8 and 10-15 were rejected under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification. Appropriate amendment has been made to Claim 1 and the reference to maintaining the temperature of the portion at the working temperature has been deleted.

Claim 1 has been further amended to specify that the dissolution rate of the glass is at least 0.01mg/cm²/hour. There is basis for such an amendment at page 9, lines 4 to 6 of the specification as filed. Claim 1 has also been amended to specify that the glass is heated into molten form by heating to a temperature of 750 to 1050°C. Basis for this amendment is found at page 4, line 24. The molten glass is then cooled to a holding temperature as set out on page 7, lines 17 to 25 and allowed to cool to a preselected working temperature of 400 to 900°C, as referred to on page 4, lines 31 to 32. Claim 1 has been further amended to specify that the **glass former comprises phosphorous pentoxide**. Basis for this amendment may be found on page 7, line 36.

Claims 1 to 8 and 10 to 15 were rejected under 35 U.S.C. 103(a) as being obvious over Gilchrist (US 5470585) in view of Loewenstein (The Manufacturing Technology of Continuous Glass Fibres, 1983) and Tooley (Handbook of Glass Manufacture, 1954). The Examiner considers that Gilchrist teaches that water soluble glass fibers may be formed by conventional methods.

The Examiner states that Gilchrist discloses the invention of fibers which are dissolvable and quotes Claims 1 and 3 to support his position. Whilst Gilchrist refers to a water

soluble glass, and reference is made to that glass being in the form of "fibres", Gilchrist fails to teach how such fibers are manufactured. The use of conventional methodology was in fact successful in only providing short brittle fibers from such compositions. The difficulty in using the conventional "heat and pull" method is that a phosphorous pentoxide water soluble glass composition remains of suitable viscosity for pulling for only a very short period, typically a few minutes, before crystallization. This contrasts to silicon dioxide based glasses conventionally used for fiber formation which may remain suitable for pulling for several hours. This problem of forming fibers from phosphorous pentoxide water soluble glass compositions had not been fully understood or elucidated prior to the date of the current Application.

It should be noted that the temperatures (as recited in the independent claim) to which the water soluble glass is heated prior to pulling and also the working temperatures (as also recited in the independent claim) to which the molten glass is cooled **are considerably lower** than the temperatures used for non-phosphorous pentoxide based non-water soluble glass compositions as referred to in the two secondary references, Loewenstein and Tooley et al. The establishment of the correct temperature for pulling the glass fibres is not a simple "routine experimentation" suggested by the Examiner. In fact, this issue of the correct temperature goes to the very heart of this invention. The difficulty is that the phosphorous pentoxide water soluble glass compositions under consideration here commence crystallization at or around the viscosity at which pulling can occur and that such crystallization is then very rapid.

Applicant submits that the Examiner's statement that "a glass is a glass is a glass" is naive. Loewenstein, one of the references cited by the Examiner in support of the 35

USC 103 objection, states on page 33 that:

"over 99% of all continuous glass fibre produced is of "E" glass type composition".

Other types of glass compositions are then discussed. None of these glass compositions are phosphorous pentoxide water soluble glass, but instead use silicon dioxide as the glass former. Thus, from the reference cited by the Examiner, it is clear that the persons of ordinary skill in the art had only succeeded in providing glass fibers from silicon dioxide compositions, none of which correspond to the glass composition under consideration here. Indeed, Applicant encloses an extract from Matweb.com for E-Glass fiber which indicates that the glass comprises 54.3% SiO₂ and has a melting point of 1725°C, well outside the range now specified in Claim 1.

A Statutory Declaration by David Healy, is submitted herewith. David Healy is named as an inventor for the present invention. The Statutory Declaration by Mr Healy evidences that, to the best of his knowledge, prior to the present invention quality water soluble glass fibers having phosphorous pentoxide as a glass former had not been produced and that the only fibers formed were relatively short and/or of brittle composition. Upon later experimentation, Mr Healy observed that phosphorous pentoxide water soluble glass making compositions have very different properties to non-water soluble glass compositions and that these different properties become manifest during fiber formation. In particular he observes that **phosphorous pentoxide water soluble glass compositions have a much steeper temperature viscosity gradient than non-water soluble glass compositions at conventional temperatures for fiber formation**. Hence a small change in temperature can result in a highly significant change in the viscosity of the glass composition. Additionally, water soluble glass

compositions crystallize much more quickly than non-water soluble glass compositions at a suitable temperature for fiber formation and this limits the lengths of the fibers which can be provided. Applicant has found that phosphorous pentoxide based water soluble glass compositions crystallize in only a few minutes.

A further Statutory Declaration by Julian Ellis, an expert in the field of fibers, is also submitted herewith. Mr Ellis asserts that at the filing date of the present Application he did not know of any methods of producing phosphorous pentoxide water soluble glass fibers having a dissolution rate of at least $0.01\text{mg}/\text{cm}^2/\text{hour}$. He was aware that water soluble glass fibers could not be formed by conventional methods, and would have understood that the disclosure made in Gilchrist at column 4, lines 42 to 49 to be incorrect.

As the viscosity of the molten non-water soluble glass compositions is so high, it is problematic to draw such compositions into fibers. The Examiner states that it would be obvious to one skilled in the art to cool glass that is too fluid to form into glass to have the appropriate viscosity. However Applicant submits that this view is overly simplistic; the steep temperature viscosity gradient of the particular glass compositions covered here mean that the composition will quickly become too viscous to pull. Additionally, due to the particular chemical composition of phosphorous pentoxide based glasses, there is a great tendency for the compositions to crystallize at or about the temperature of fiber formation and thus prevent fiber formation. Hence, the temperature ranges specified in Claim 1 need to be carefully observed.

Applicant respectfully asserts that Claim 1 as amended is allowable, and that the Examiner's objections have been overcome. The Examiner also raised objections to the

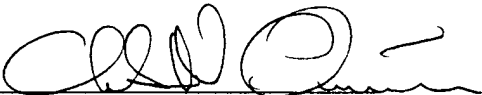
obviousness of dependent Claims 2 to 8 and 10 to 15.

Applicant asserts that as amended Claim 1 is inventive, the dependent Claims are also inventive.

The Applicant believes that the present amended Application is in a condition for allowance and issuance of the Patent is earnestly solicited.

Respectfully submitted,

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